

REMARKS

This application contains claims 1-75. Claim 48 has been amended. No new matter has been introduced. Reconsideration is respectfully requested.

Applicants note that the Examiner has indicated that the Information Disclosure Statement filed on July 10, 2001 allegedly failed to comply with the provisions of the rules. However, Applicants did not file an Information Disclosure Statement in this application until October 17, 2001. Applicants note that the PTO form 1449 attached to the Examiner's Office Action indicates that all but two of the references were considered by the Examiner. It is assumed that the two references not initialed by the Examiner have not been considered because copies were missing from the file. As evidenced from the attached postcard, Applicants submitted 19 references, which is the total number listed on the PTO-1449 form. However, Applicants' representative has requested another copy of the references from applicants for the Examiner's consideration. A copy of each is attached to the IDS filed concurrently herewith.

Claim 48 was objected to for a typographical error. The error has been corrected as suggested by the Examiner.

Claims 1-8, 10, 13-22, 26-33, 35, 38-47, 51-58 and 63-72 were rejected under 35 U.S.C. 102(b) over Itoh (U.S.

Patent 5,740,320). Applicants respectfully traverse this rejection.

Itoh describes a method of text-to-speech synthesis by concatenation of representative phoneme waveforms selected from a memory. The representative waveforms are chosen by clustering phoneme waveforms recorded in natural speech, and selecting the waveform closest to the centroid of each cluster as the representative waveform for the cluster (abstract). Itoh describes his method as a "waveform compilation type speech synthesis method" (col. 3, lines 9-10). He explains this type of method in col. 2, lines 48-58 (emphasis added):

"Where a given text is synthesized into speech, phoneme waveforms corresponding to respective phonemes in the text are selected as speech synthesis units from the database memory... and are concatenated one after another. In this instance, since the phoneme waveforms that are read out... are natural speech waveforms,... the centroid of each cluster is obtained as a waveform in the time domain, not as the LPC parameter matrix."

He goes on to explain that this type of time-domain waveform compilation speech synthesis is better than the parameter compilation type (col. 2, lines 61-62).

Itoh's speech synthesizer is made up of an analysis part 10 and a synthesis part 20 (Fig. 1 and col. 4, lines 57-59):

- Within analysis part 10, an LPC analysis part 13 performs LPC (linear predictive coefficient) analysis of phoneme waveforms to generate LPC parameters of each phoneme waveform in a database 11 (col. 5, lines 19-35). The LPC parameter matrix nearest the centroid matrix for each waveform cluster is stored in a waveform information memory 16 (col. 5, lines 40-46).
- Within synthesis part 20, a synthesis unit selection part 24 reads out optimum phoneme waveforms from memory 16 based on phoneme labels derived from the text to be synthesized (col. 6, lines 33-39). Then a waveform synthesis part imparts phoneme duration, pitch and power to the phoneme waveforms and outputs the concatenated waveforms as synthesized speech (col. 6, lines 54-60).

Claim 1 recites a method for speech synthesis using a segment inventory that comprises respective sequences of feature vectors for a plurality of speech segments. To synthesize an output speech signal, sequences of feature vectors are selected from the inventory. The selected sequences of feature vectors are concatenated into an output series of feature vectors, which are used to compute a series of complex line spectra of the output signal. The complex line spectra are then transformed to a time domain speech signal for output.

In other words, whereas Itoh's speech synthesizer is based on concatenating time-domain waveforms (see col. 2, lines 57-58, and col. 6, lines 54-60, cited above), claim 1 is directed clearly to feature-domain concatenation. Itoh explicitly teaches away from feature-domain concatenation approaches, to which he refers as "parameter compilation type speech synthesis" (col. 2, lines 61-63). Thus, Itoh cannot be taken to teach the step of "processing the selected sequences... so as to generate a concatenated output series of feature vectors" that is recited in claim 1.

The Examiner identified this "processing" step in claim 1 with Itoh's clustering of LPC parameter vectors (col. 5, lines 19-35) in LPC analysis part 13. As pointed out above, however, this aspect of Itoh's method belongs to his analysis part 10, which prepares LPC parameter matrices for storage in his waveform information memory 16, to be used only later in the synthesis part. Furthermore, "clustering," as described by Itoh (col. 5, lines 6-18), consists of gathering together similar phonemes from different parts of an input speech database 11. It has nothing to do with generating an ordered, concatenated output series for speech synthesis. Therefore, Applicants respectfully submit that the identification of the "processing" step in claim 1 with Itoh's clustering is incorrect.

The Examiner then went on to identify the next claim step of "computing a series of complex line spectra of the output signal" with this same passage in Itoh (col. 5, lines 19-35). As pointed out above, the passage in question deals with Itoh's analysis part, and not with synthesis of the output signal. Furthermore, the term "complex line spectrum" is explicitly defined in the present patent application as "the sequence of respective sine-wave amplitudes, phases and frequencies in a sinusoidal speech representation" (page 6, lines 12-16). There is simply no mention or suggestion of the use of this sort of representation in Itoh, either in the cited passage or elsewhere.

Therefore, Applicants respectfully submit that claim 1 is patentable over Itoh. In view of the patentability of claim 1, claims 2-8, 10 and 13-15, which depend from claim 1, are believed to be patentable, as well.

Claim 16 recites a method for speech synthesis, in which the spectral envelopes of an input speech signal are estimated in a succession of time intervals during each segment of the speech signal. The spectral envelopes are integrated over a plurality of window functions in the frequency domain so as to determine elements of feature vectors. The feature vectors are then concatenated in order to reconstruct an output speech signal.

In rejecting this claim, the Examiner identified the step of "concatenating the feature vectors" with Itoh's concatenation of "synthesis units (phoneme waveforms)" (col. 6, lines 54-60). Applicants respectfully point out that in rejecting claim 1, the Examiner identified the feature vectors of the present invention with Itoh's LPC parameter vectors, rather than with Itoh's phoneme waveforms, which are different and distinct from the parameter vectors. (The distinction is made clear, for example, in col. 5, lines 19-25, cited by the Examiner in reference to this claim.) As noted above, Itoh's phoneme waveforms are time-domain entities, which are concatenated in the time domain. Itoh teaches away from parameter-domain concatenation (col. 2, lines 61-64), as recited in claim 16. Therefore, Applicants respectfully submit that it is incorrect to identify the "concatenating of feature vectors" recited in claim 1 with Itoh's concatenation of phoneme waveforms.

Thus, it is believed that claim 16 is patentable over Itoh. In view of the patentability of claim 16, claims 17-22, which depend from claim 16, are also believed to be patentable.

Independent claims 26 and 41 recited devices for speech synthesis, while independent claims 51 and 66 recite computer software products. The claimed devices and products

operate on principles similar to the methods of claims 1 and 16, and these device and product claims were rejected on grounds identical to the grounds of rejection of claims 1 and 16. Therefore, for the reasons stated above, independent claims 26, 41, 51 and 66 are believed to be patentable over Itoh, as are claims 27-33, 35, 38-40, 42-47, 52-58, 63-65 and 67-72, which depend from these independent claims.

Claims 3, 13, 18, 28, 43, 53, 63 and 68 were rejected under 35 U.S.C. 102(e) over Ittycheriah et al. (U.S. Patent 6,014,300). Applicants are puzzled by this rejection, but traverses the rejection in any case. In rejecting these dependent claims, the Examiner asserted that certain passages in Ittycheriah (mistakenly identified as passages in Itoh) disclose the added limitations recited in the claims in question. The Examiner did not, however, point to any teaching in Ittycheriah of the limitations of the base claims and intervening claims from which claims 3, 13, 18, 28, 43, 53, 63 and 68 depend.¹ It goes without saying that a dependent claim incorporates by reference all the limitations of its base and intervening claims, and cannot be rejected for lack of novelty unless all those limitations are disclosed in the cited art.

¹ If this rejection was incorrectly stated in the Office Action, and, in its correct form, will be reapplied, a new, non-final Office Action is respectfully requested.

In any event, Ittycheriah describes a method for speech synthesis, which, like Itoh's method, uses time-domain waveform concatenation (see, for example, Fig. 1, block 18). Therefore, for the reasons stated above, Ittycheriah cannot be taken to teach or suggest the methods of feature-domain concatenation recited in independent claims 1, 16, 26, 41, 51 and 66, from which claims 3, 13, 18, 28, 43, 53, 63 and 68 depend. Thus, all the claims in the present patent application are believed to be patentable over Ittycheriah, whether this reference is taken alone or in combination with Itoh.

Claims 9, 11, 12, 23-25, 34, 36, 37, 48-50, 59, 61, 62, 73-75 were rejected under 35 U.S.C. 103(a) over Itoh in view of one or more of Campbell (U.S. Patent 6,366,883), Mizuno et al. (U.S. Patent 6,334,106), Coorman et al. (U.S. Patent 6,665,641) and Matsumoto (U.S. Patent 5,940,795). Applicants respectfully traverse these rejections. In view of the patentability of the independent claims in this application, as explained above, dependent claims 9, 11, 12, 23-25, 34, 36, 37, 48-50, 59, 61, 62, 73-75 are believed to be patentable, as well.

Although Applicants have not specifically argued the patentability of the dependent claims, these dependent claims are believed to recite independently-patentable subject

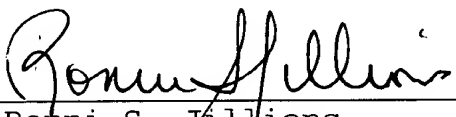
matter, notwithstanding the patentability of the independent claims. Arguments with respect to the dependent claims have been omitted in the interest of brevity.

Applicants have studied the additional references made of record by the Examiner, and believes that all the claims in the present patent application are patentable over these references, whether the references are taken individually or in any combination.

Applicants believe the amendments and remarks presented hereinabove to be fully responsive to all of the objections and grounds of rejection raised by the Examiner. In view of these amendments and remarks, Applicants respectfully submit that all of the claims in the present application are in order for allowance. Notice to this effect is hereby requested.

Respectfully submitted,

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